

# Farmed Fan Breeding System based on High Pile Cap Foundation

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## Abstract

Nowadays, our country is facing the situation of high density of offshore aquaculture, low environmental capacity of the sea area, and a lot of waste from aquaculture, which seriously pollutes the water quality of the offshore area and destroys the offshore ecological environment. In order to comply with the policy of protecting the environment, the development of offshore aquaculture will become the trend of cage aquaculture. This paper establishes a high-piled platform-based offshore wind turbine farming system, which uses part of the electric energy converted by the wind turbines for sea cage culture to promote the automation of sea cage culture and increase the income of offshore farming.

## Keywords

Offshore Aquaculture; High-pile Cap Foundation; Aquaculture Cages; Offshore Wind Turbines.

## 1. Fan and pile foundation type

### 1.1 Pile foundation type of domestic and foreign fans

At present, the common types of offshore wind turbine pile foundations at home and abroad mainly include gravity shallow foundations, super large diameter single pile foundations, suction bucket foundations, tripod foundations, jacket foundations and high pile foundations. Each type of pile foundation is as follows:

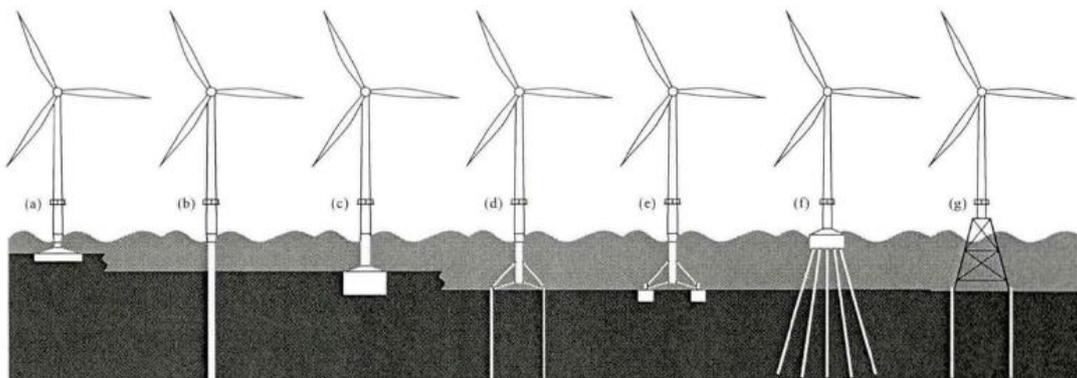


Figure 1. Common offshore wind turbine pile foundation types at home and abroad

Among them, a is a gravity shallow foundation, b is a super large diameter single pile foundation, c is a suction bucket foundation, d is a tripod foundation, e is a multi-bucket foundation, f is a high-pile foundation, and g is a jacket foundation.

Because the water depth of the high-pile foundation has good flexibility, high rigidity, strong anti-overturning ability, and easy to combine with the breeding cage, which is convenient for the retracting



intelligent breeding device 5. The staff can put the fry into the fry feeding tube 203 on the platform, and put the fish food into the material feeding port 202, and does not require personnel to dive into the sea for operation, which is convenient for operation and management.

Each support column 3 is sleeved with at least two connecting sleeves 301. The connecting sleeves 301 are connected to the prism frame 404 through a mooring line 302. The frame cross brace 405 is rotatably connected with the central sleeve 404, and the floating frame cross brace 405 can rotate axially around the central sleeve 404, showing that all the floating frame prisms 403 and the floating frame cross brace 405 are folded on one side of the central sleeve 404. The floating frame 402 makes the aquaculture cage 4 foldable. When removing the cage, first fold the floating frame 402 and close the net 401, and use the hook 6 to lower the cage and haul it out of the space inside the pile to facilitate the recovery of the aquaculture cage 4 jobs.

## 2.2 Central liftable cage

The raising and lowering cage aquaculture system is mainly composed of the main structure of the cage lifting, PCL controller, hydraulic drive part and upper computer monitoring part. It mainly includes floats, cables, upper and lower wheels, connecting rings and pile legs, which are used in many applications. The central area surrounded by a fan.

Among them, the leg is an important part of the cage fixed on the seabed. It can be driven into the seabed to ensure the firmness of the entire cage and support the system's lifting and balance. The legs are made of solid steel to prevent long-term erosion by seawater.

The device realizes the preset rotation and speed of the stepping motor through the upper computer software, and quantitatively adjusts the length of the cable. When the cage is raised, the two cables of the upper pulley can be pulled, and when the cage is lowered, the two cables of the lower pulley can be pulled. The PLC can monitor the lifting status in real time by processing and analyzing the collected signals, thereby realizing data monitoring and fault alarms, and improving the safety of the cage lifting and lowering process.

## 3. Far-sea fan breeding system

### 3.1 Installation location

This intelligent fan farming system is mainly installed in the deep sea area, and part of the electric energy converted by the fan is used for sea cage culture, which promotes the automation of sea cage culture and increases the income of offshore aquaculture. The development of offshore aquaculture will alleviate the plight of offshore aquaculture and protect offshore ecology. The environment promotes the prosperity of my country's aquaculture industry. The installation and application effect diagram of this device is as follows:



Figure 3. Installation and operation effect of the device

### 3.2 Application prospects

(1) The deep-sea fan aquaculture system can form multiple combinations to form a breeding net group to realize the large-scale development of the deep-sea aquaculture industry.

- (2) Offshore wind power generation can also be combined with multiple devices to form a wind power generation group to increase the power generation and provide electricity for offshore drilling or other energy extraction facilities. Using wind energy to generate electricity on islands with better wind energy conditions can effectively solve their power supply problems and promote local development.
- (3) With the help of the deep-sea fan breeding system, an ocean platform is formed to provide production and life guarantee for drilling, oil extraction, transportation, observation, navigation, construction and other activities at sea.
- (4) Utilizing the stability of offshore wind turbines and creating a new integrated development model of the "offshore wind power functional circle" can lengthen the industrial chain and realize the diversified development of the industry.

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